

Performance of Technical Skills of Diabetes Management: Increased Independence After a Camp Experience

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This study examines some educational effects of a camp experience on independent performance of tasks in the management of diabetes mellitus. One hundred and eleven children were studied with regard to insulin administration, urine glucose testing, recognition of hypoglycemic reactions, adherence to diet, and over-all independence. There was a significant increase in independent measurement of insulin dose, administration of insulin injections, and urine glucose testing. No significant differences were seen in dietary adherence or ability to recognize hypoglycemic reactions. Precamp data indicated that returning campers demonstrated greater independence in insulin administration prior to camp than did new campers. After camp, both new and returning campers showed significant increases in independent performance of dose measurement and injection. It is concluded that a camp educational experience contributes to both the knowledge and performance of self-care techniques required in the management of diabetes mellitus. *DIABETES CARE* 1: 23-26, JANUARY-FEBRUARY, 1978.

The concept of specialized camps for children with diabetes mellitus developed shortly after the advent of insulin.¹ There are now nearly 60 such camps in the United States.² Included in the objectives of such camps is the education of campers about diabetes.³

The ultimate goal of any educational process is a planned change in behavior. It is helpful to evaluate the efficacy of the educational process in terms of information acquired (i.e., knowledge). However important such learning is, if the crucial goal is an alteration in the behavior of these children with regard to management of their diabetes, they must not only attain information; they must use it. If the child acquires new knowledge without practicing it, the educational potential is not fully realized.

This study is an attempt to determine the impact of a camping experience for children with diabetes on their independent utilization of the mechanical skills needed for the daily management of their condition.

METHODS

The study population includes 111 children (59 girls, 52 boys, ages 7-17, mean age 11.7 ± 2.4 years), all with insulin-independent diabetes mellitus, who attended one session of Carolinas' Camp for Children with Diabetes

(CCCD). There they learned and practiced techniques of self-management of diabetes, as previously described.⁴

Parents of campers completed a precamp questionnaire the week prior to camping, and results were tabulated for all campers. Medical staff interviews with the parents and campers on the day of registration resolved ambiguous responses. At the conclusion of the two-week camp session, the same medical staff completed camper performance evaluation forms. A follow-up questionnaire was mailed to all parents six months after camp ended. Replies were received from 98 per cent (109 campers' parents). Ambiguities were resolved by telephone contact. Copies of the questionnaires and staff evaluation form are available from the authors on request.

Statistical significance was calculated by the distribution of chi-square.⁵

RESULTS

Forty-six campers (41 per cent) who had never before attended a camp for children with diabetes represent the "new camper" group. The other 65 campers (59 per cent) had previously attended CCCD at least one year: 27 had attended once previously; 19 twice; five three times; eight four times; and six had attended for five previous years. They represent "old campers."

For each task, performance was described by one of the following statements: (1) child does task alone (most or all of the time); (2) child does task with help (most or all of the time); (3) someone else does the task (most or all of the time). These are abbreviated: 1 "alone"; 2 "with help"; 3 "someone else."

Insulin administration. Insulin administration was considered to represent two tasks: measurement of insulin dosage and injection of insulin. Distribution of performance of these tasks before camp, at the end of camp, and after six to eight months at home appears in figure 1A and B. At the end of camp, there is a statistically significant ($p < 0.001$) increase in independent performance of both tasks. This independent performance is sustained at a level that is highly statistically significant ($p < 0.001$) in comparison to precamp performance.

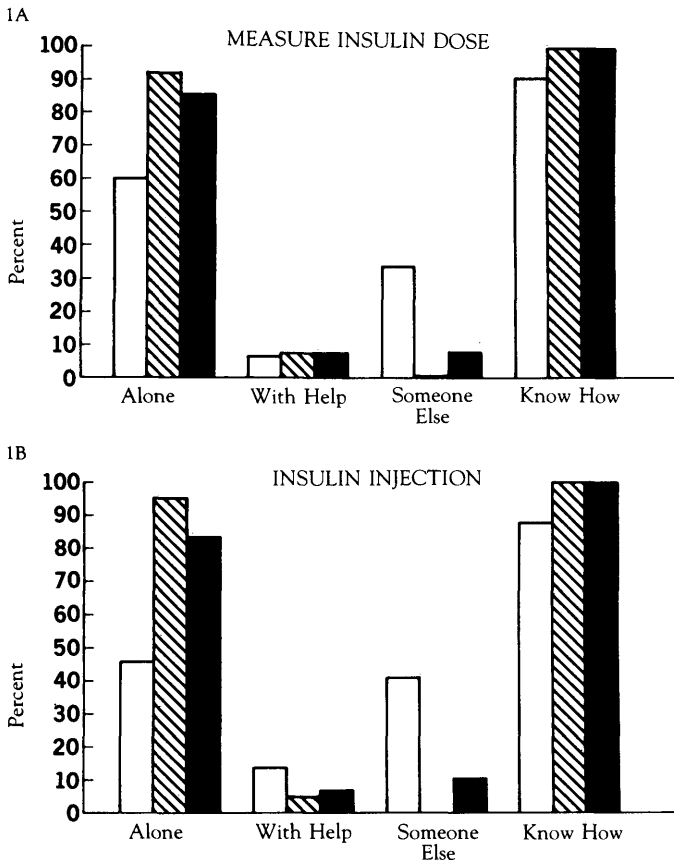


FIG. 1. Administration of insulin. 1A: insulin dose measurement. 1B: insulin injection. For each task, bars indicate percentage of campers performing task "alone," "with help," or having "someone else" perform task all or most of the time and percentage of campers who "know how" to perform the task. Open bars are for performance prior to camp, cross-hatched bars at end of camp, and solid bars six to eight months after camp.

Also shown in figures 1A and B is the percentage of campers at each time who knew how to perform the task, enabling the distinction of knowledge from actual performance. For both tasks, prior to camp there was a significant ($p < 0.001$) difference in knowledge compared with performance. The number of campers having adequate knowledge of how to perform the tasks was increased at camp ($p \leq 0.001$).

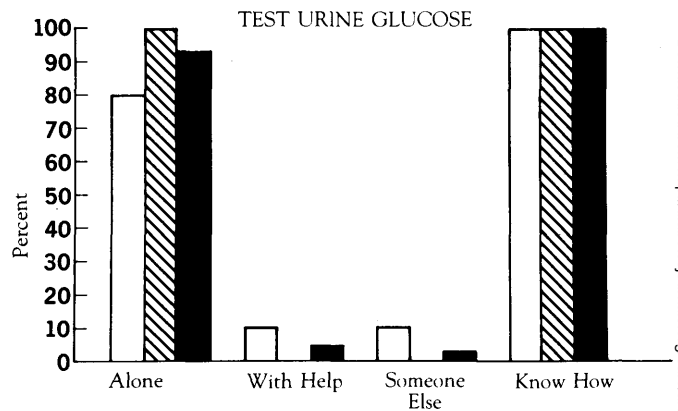


FIG. 2. Urine glucose testing. Same symbols as figure 1.

Urine testing. The distribution of performance of urine glucose testing appears in figure 2, in the same format as used for figure 1. Again, a significant ($p < 0.001$) increase in independent performance after camp is evident. This, too, is sustained ($p < 0.001$) at the time of the follow-up survey, compared with precamp performance. Again, prior to camp, a significant ($p < 0.05$) difference in performance versus knowledge is detected.

Frequency of urine testing was also surveyed. There was no change in frequency between precamp responses and those of the follow-up survey.

Dietary adherence. At camp, a dietary exchange system was used, with the exchanges outlined pictorially in Select-A-Meal booklets.⁶ Campers were given these booklets and encouraged to continue to use them at home. After six to eight months, 40 per cent indicated that they regularly used the Select-A-Meal system.

Parents were also asked their general assessment of the frequency with which the child exercised care in food selection. Results are shown in figure 3. No significant change is seen.

Recognition of hypoglycemic reactions. The parental survey indicated that 79 per cent of campers could recognize hypoglycemic reactions before camp and 86 per cent after camp, (no significant statistical difference). Prior to camp, 51 per cent of the children regularly carried "some form of sugar" with them, while 60 per cent did so after camp (no significant statistical difference).

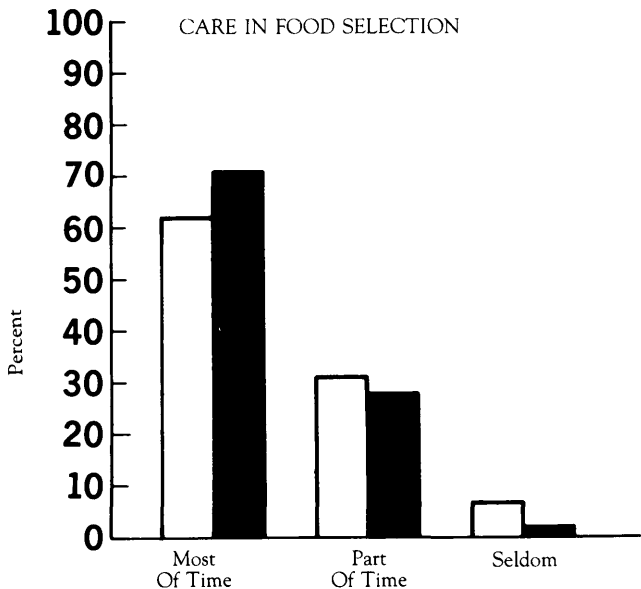


FIG. 3. Care in food selection. Percentage of campers who exercised care in food selection "most of the time," "part of the time," or "seldom," according to parents' indications. Open bars prior to camp, solid bars at six to eight months' follow-up.

General independence. Parents were asked to assess the over-all effect of their child's being at camp. The majority (87 per cent) indicated that the camping experience had made their child "more independent," while 11 per cent indicated "no change," and 2 per cent indicated that their child appeared "less independent" after camp.

Effects of previous camp exposure. Figure 4 shows a comparison of "old" and "new" campers' independent performance in the tasks of insulin dose measurement, insulin injection, and urine glucose testing. Prior to camp, old campers were more independent than new campers in both dose measure-

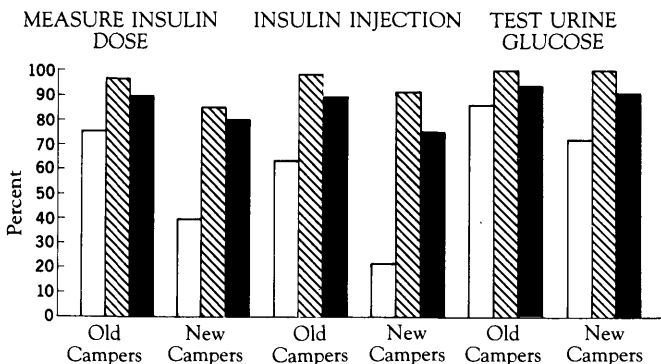


FIG. 4. Comparison of percentage of old and new campers who performed tasks of insulin administration and urine glucose testing alone. Bars represent same times as figure 1.

ment ($p < 0.001$) and insulin injection ($p < 0.001$), while the difference in urine glucose testing was not statistically significant. Six months after camp, the only statistically significant difference between "old" and "new" campers was in insulin injection ($p < 0.05$). Both groups showed statistically significant increases after camp in independent performance of dose measurement and insulin injection, while only the new campers increased in independence of urine glucose testing ($p < 0.01$).

DISCUSSION

The educational experience during a two-week camp session helped children with diabetes become more independent in the management of their condition. This was evidenced by improvement in both knowledge and performance of insulin dose measurement, injection, and urine glucose testing. There was a smaller difference between knowledge of proper technique and actual utilization of the knowledge (i.e., not only did they acquire knowledge, but behavior change was effected).

It is clearly impossible to discount effects of the normal maturation process and of other social and environmental factors on the increased independence in management of diabetes by these children. It is also impossible to exclude effects of continued exposure to diabetes and of greater acceptance of the condition. Indeed, the latter is probably fostered by the camp experience, during which feelings of isolation and difference are minimized as campers are able to observe others effectively dealing with their diabetes. Nevertheless, the marked increase in performance during the actual camp session is taken as evidence that the educational experience at camp was a major factor in the resulting changes in behavior.

Normal childhood development depends both on graded learning experiences, with children each year adding to their knowledge, and skill, and on continued reinforcement. Total independence is not a desirable goal, particularly for younger children. There are clearly potential dangers associated with insulin administration. Nevertheless, the supervised independent performance of mechanical skills in diabetes management is a desirable goal. The acquisition and performance of such skills needs to be individualized, with gradual addition of new skills as the child is able to handle them.

The developmental process and the value of periodic reinforcement is reflected in our experience with old campers. Their baseline independent performance before camp was less than the total group's six months after camp. If we make the assumption that they had attained the same level the previous year after camp, then there must have been a gradual decline over the year. There was then a sustained further improvement after a renewed camping experience

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and a year of growth. Repeated camp experiences and further growth thus may be beneficial. Clearly, more can be achieved after a year's growth and repeat exposure to the camp setting.

We had previously been impressed by the obvious acquisition of knowledge and performance of our campers by the end of a camp session. We had noted, however, that some campers had not utilized their skills at home, as evidenced by their parents' reports at reentry to camp the following summer. A pilot study at our camp by McNeill and Kerr,⁷ however, showed that although a few old campers had stopped using their skills, as a group they reported more independent performance than new campers. The current study not only confirms and extends this observation but also provides evidence that the increased knowledge results in increased performance and that such performance is generally sustained at least six to eight months. A slightly greater mean age for returning campers (12.4 years vs. 10.8 years) and the longer duration of their diabetes (5.1 years vs. 3.6 years) certainly also contributed to the difference between these groups.

The independent performance after six to eight months is less than that at the end of camp. At camp we have the advantages of the peer-group setting, supervision by health professionals, and a policy of encouraging independent performance. At home, many parents and children seem to prefer a more dependent relationship.

We have demonstrated our inability to improve care in food selection despite our belief that proper diet is the cornerstone of successful therapy. Our questionnaire method may be imperfect in detection of improved adherence to diet. It is more likely, however, that our data reflect a need for more effective parent and camper dietary educational and motivational techniques. However, inducing a changed pattern of food intake is a difficult task.⁸

This study demonstrates that the educational experience at a summer camp for children with diabetes mellitus and the practice of mechanical skills of diabetes management at such a camp contribute to increased performance of those skills. The increased independent performance is sustained

after the camp session ends. We conclude that a camping experience for children with diabetes, particularly if designed to include education about skills required in management and an opportunity to practice them, can be an important adjuvant in the total program of management of childhood diabetes mellitus. Such a camp program can foster the acquisition of mechanical skills that can be incorporated into the over-all management program of an individual camper, consistent with his/her maturation.

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